CLAIMS

1. An apparatus for magnetic resonance imaging of an anatomic region of a human pelvis, comprising:

an endourethral magnetic resonance imaging (MRI) coil comprising an antenna;

an interface circuit interposed between the antenna and a MRI machine, said interface circuit being in electrical communication with the antenna and being in electrical communication with the MRI machine, said interface circuit comprising a tuning-matching circuit, a decoupling circuit and a balun circuit; and

a housing enveloping the antenna.

2. The system of claim 1, wherein the antenna resides on a flexible circuit board.

3. The system of claim 1, wherein the interface circuit further comprises a DC regulating circuit.

4. The system of claim 3, wherein at least one of the tuning-matching circuit, the decoupling circuit, the balun circuit and the DC regulating circuit is enclosed within an interface box connected to the antenna by a connector.

5. The system of claim 3, wherein at least one of the tuning-matching circuit, the decoupling circuit, the balun circuit and the DC regulating circuit is enclosed within an interface box connected to the antenna by a wireless connection

6. The system of claim 1, wherein the antenna is a receive-only coil.

7. The system of claim 1, wherein the tuning-matching circuit comprises at least two sets of capacitors, a first set in series and a second set in parallel.

8. The system of claim 2, wherein at least one of the tuning-matching circuit and the decoupling circuit resides on the flexible circuit board.

9. The system of claim 1, wherein the decoupling circuit comprises a PIN diode.

10. The system of claim 1, wherein the housing is sealed at a distal end.

11. The system of claim 1, wherein the electrical communication between said interface circuit and said MRI machine comprises a wireless connection.

12. An apparatus for magnetic resonance imaging (MRI) of an anatomic region of a human pelvis, comprising:

an endourethral magnetic resonance imaging coil system, comprising a first antenna and a second antenna, wherein said second antenna is oriented at a preselected position with respect to said first antenna;

an interface system interposed between a MRI machine and said first and second antennas, said interface system being in electrical communication with said MRI machine and with each of said first antenna and said second antenna, said interface system comprising a tuning-matching system, a decoupling system and a balun system; and

a housing enveloping at least one of said first antenna and said second antenna.

13. The apparatus of claim 12, wherein at least one of said first antenna and said second antenna resides on a flexible circuit board.

14. The apparatus of claim 12, wherein the preselected position arranges said first antenna at a preselected angle to said second antenna.

15. The apparatus of claim 14, wherein said preselected angle is about 90 degrees.

16. The apparatus of claim 12, wherein said preselected position produces a quadrature pattern between said first antenna and said second antenna.

17. The system of claim 12, wherein said interface system comprises a first interface circuit and a second interface circuit, said first interface circuit comprising a first tuning-matching circuit, a first decoupling circuit and a first balun, and said second interface circuit comprising a second tuning-matching circuit, a second decoupling circuit and a second balun, said first interface circuit being interposed between said first antenna and the MRI machine and being in electrical communication with said first antenna and said MRI machine, and said second interface circuit being interposed between said second antenna and said MRI machine and being in electrical communication with said second antenna and said MRI machine.

18. The system of claim 12, wherein the endourethral MRI coil system further comprises a decoupling paddle positionable between said first antenna and said second antenna.

19. The system of claim 18, wherein said decoupling paddle is angularly positionable at an angular position about equidistant between said first antenna and said second antenna.

20. The system of claim 18, wherein a position of said decoupling paddle is adjustable by a user of the endourethral MRI coil system.

21. The system of claim 18, wherein the decoupling paddle is formed in a shape substantially similar to at least one of said first antenna and said second antenna.

22. The system of claim 18, wherein the decoupling paddle is substantially similar in at least one dimension to at least one of said first antenna and said second antenna.

23. The system of claim 12, wherein at least one of said first antenna and said second antenna is a receive-only coil.

24. The system of claim 12, wherein said tuning-matching system comprises at least two sets of capacitors, a first set in series and a second set in parallel.

25. The system of claim 12, wherein said decoupling system comprises a PIN diode.

26. The system of claim 12, wherein said electrical communication between said interface system and said MRI machine comprises a wireless connection.

27. The system of claim 12, wherein the housing comprises an insulator layer applied to cover the at least one of said first antenna and said second antenna.

28. The system of claim 12, wherein the housing comprises a hollow tubular member.

29. The system of claim 28, wherein the hollow tubular member is sealed at a distal end.

30. The system of claim 28, wherein the hollow tubular member envelops said first antenna and said second antenna.

31. A system for treating an anatomic region within a pelvis of a patient, comprising:

an elongate member insertable into a urethra of the patient and temporarily retainable in said urethra, said elongate member housing an endourethral imaging system and an endourethral therapeutic system, wherein said endourethral imaging system comprises an endourethral MRI coil comprising an antenna, and said endourethral therapeutic system comprises an endourethral delivery device to deliver a mode of therapy transurethrally to an area of the anatomic region imaged by the endourethral imaging system; and

an interface circuit interposed between said antenna and a MRI machine, said interface circuit being in electrical communication with said antenna and being in electrical communication with the MRI machine, said interface circuit comprising a tuning-matching circuit, a decoupling circuit and a balun circuit.

32. The system of claim 31, wherein the elongate member is temporarily retained in a preselected position by an inflation of a balloon.

33. The system of claim 31, wherein the antenna resides on a flexible circuit board.

34. The system of claim 31, wherein the mode of therapy comprises electromagnetic radiation.

35. The system of claim 34, wherein the electromagnetic radiation comprises light energy.

36. The system of claim 35, wherein the light energy is produced by a laser.

37. The system of claim 34, wherein the electromagnetic radiation comprises microwave energy.

38. The system of claim 34, wherein the electromagnetic radiation comprises infrared radiation.

39. The system of claim 34, wherein the electromagnetic radiation comprises ultraviolet radiation.

40. The system of claim 31, wherein the mode of therapy comprises a pharmacologic agent.

41. The system of claim 40, wherein the pharmacologic agent comprises a radiation source.

42. The system of claim 31, wherein the mode of therapy comprises an implantable device.

43. The system of claim 31, wherein at least one of said tuning-matching circuit, said decoupling circuit and said balun is enclosed within an interface box connected to the antenna with a connector.

44. The system of claim 31, wherein at least one of said tuning-matching circuit, said decoupling circuit and said balun is enclosed within an interface box connected to the antenna with a wireless connection.

45. The system of claim 33, wherein at least one of said tuning-matching circuit, said decoupling circuit and said balun resides on said flexible circuit board.

46. The system of claim 31, wherein the electrical communication between said interface circuit and said MRI machine comprises a wireless connection.

47. The system of claim 31, wherein said endourethral therapeutic system is affixed to an outside surface of the elongate member.

48. The system of claim 47, wherein said endourethral therapeutic system is temporarily affixed to said outside surface and is displaceable therefrom.

49. The system of claim 31, wherein said endourethral therapeutic system is contained within a surrounding layer applied external to the elongate member.

50. The system of claim 31, wherein said endourethral therapeutic system is contained within said elongate member.

51. The system of claim 31, wherein said elongate member comprises a hollow tubular member.

52. The system of claim 51, wherein said endourethral therapeutic system is contained within said hollow tubular member.

53. The system of claim 52, wherein said endourethral therapeutic system is displaceable from a first position within said hollow tubular member to a second position external to said hollow tubular member.

54. The system of claim 53, wherein said delivery device, upon the positioning of the endotherapeutic system in said second position, is activated for delivering the mode of therapy.

55. A method for treating an anatomic region within a pelvis of a patient, comprising:

providing a medical device comprising an elongate member insertable into and temporarily retainable within a urethra of the patient, said elongate member housing an endourethral imaging system and an endourethral therapeutic system, wherein said endourethral imaging system comprises an endourethral MRI coil comprising an antenna, and said endourethral therapeutic system comprises an endourethral delivery device to deliver a mode of therapy transurethrally to an area of the anatomic region imaged by the endourethral imaging system;

providing an interface circuit interposed between said antenna and a MRI machine, said interface circuit being in electrical communication with said antenna and being in electrical communication with the MRI machine, said interface circuit comprising a tuning-matching circuit, a decoupling circuit and a balun circuit;

providing the MRI machine;

inserting said elongate member into the urethra of said patient;

temporarily retaining said elongate member in said urethra;

positioning the pelvis of the patient in a diagnostically effective position relative to the MRI machine;

using the MRI machine to excite magnetic resonance signals within tissues surrounding the anatomic region;

applying gradient magnetic pulses to said human pelvis to spatially encode the magnetic resonance signals;

receiving said magnetic resonance signals in said endourethral MRI coil and producing responsive output signals therefrom;

processing said output signals to obtain an image of the anatomic region;

identifying an area of the anatomic region to be treated;

positioning the endourethral therapeutic system in therapeutic proximity to the area; and

delivering transurethrally the mode of therapy to said area using said transurethral delivery device.

56. The method of claim 55, further comprising obtaining a post-therapeutic image of the area.

57. The method of claim 54, wherein the step of obtaining the post-therapeutic image of the area is performed using said endourethral imaging system.

58. A method of examining an anatomic region of a human pelvis, comprising:

providing an endourethral magnetic resonance imaging (MRI) receiver coil comprising an antenna residing on a flexible circuit board;

providing an interface circuit interposed between said antenna and a MRI machine, said interface circuit being in electrical communication with said antenna and being in electrical communication with said MRI machine, said interface circuit comprising a tuning-matching circuit, a decoupling circuit and a balun circuit;

providing a housing enveloping the antenna;

providing the MRI machine;

inserting the endourethral MRI receiver coil into a human urethra;

situating the human pelvis within a main magnetic field of the MRI machine;

imposing said main magnetic field on the human pelvis;

applying RF pulses to said human pelvis to excite magnetic resonance signals within the human pelvis;

applying gradient magnetic pulses to said human pelvis to spatially encode the magnetic resonance signals;

receiving said magnetic resonance signals in said endourethral MRI receiver coil;

emitting responsive output signals from said endourethral MRI receiver coil; and

processing said output signals and converting them into information about the anatomic region of the human pelvis,

thereby to examine said anatomic region.

59. A method of diagnosing an abnormality of a prostate of a patient, comprising:

providing an endourethral magnetic resonance imaging (MRI) receiver coil comprising an antenna residing on a flexible circuit board;

providing an interface circuit interposed between the antenna and a MRI machine, said interface circuit being in electrical communication with said antenna and being in electrical communication with said MRI machine, said interface circuit comprising a tuning-matching circuit, a decoupling circuit and a balun circuit;

providing a housing enveloping the antenna;

providing the MRI machine;

inserting the endourethral MRI receiver coil into a prostatic urethra;

situating the prostate of the patient within a main magnetic field of the MRI machine;

using the MRI machine to excite magnetic resonance signals within tissues surrounding the prostatic urethra;

applying gradient magnetic pulses to said prostate to spatially encode the magnetic resonance signals;

receiving said magnetic resonance signals in said endourethral MRI receiver coil and producing responsive output signals therefrom;

processing said output signals to obtain data about the tissues surrounding the prostatic urethra; and

evaluating said data to diagnose the abnormality of the prostate.

60. A method of diagnosing an abnormality of a pelvic floor of a female patient, comprising:

providing an endourethral magnetic resonance imaging (MRI) receiver coil comprising an antenna residing on a flexible circuit board;

providing an interface circuit interposed between the antenna and a MRI machine, said interface circuit being in electrical communication with said antenna and being in electrical communication with said MRI machine, said interface circuit comprising a tuning-matching circuit, a decoupling circuit and a balun circuit;

providing a housing enveloping the antenna;

providing the MRI machine;

inserting said endourethral MRI receiver coil into a female urethra;

situating said pelvic floor within a main magnetic field of the MRI machine;

using the MRI machine to excite magnetic resonance signals within tissues surrounding the female urethra;

applying gradient magnetic pulses to the tissues surrounding the female urethra to spatially encode the magnetic resonance signals;

receiving said magnetic resonance signals in said endourethral receiver coil and producing responsive output signals therefrom;

processing said output signals to obtain data about the tissues surrounding the female urethra; and

evaluating said data to diagnose the abnormality of the female pelvic floor.

61. A method of diagnosing a condition of a pelvis of a pediatric patient, comprising:

providing an endourethral magnetic resonance imaging (MRI) receiver coil comprising an antenna residing on a flexible circuit board, said endourethral MRI receiver coil being dimensionally adapted for insertion into a urethra of the pediatric patient;

providing an interface circuit interposed between said antenna and a MRI machine, said interface circuit being in electrical communication with said antenna and being in electrical

communication with the MRI machine, said interface circuit comprising a tuning-matching circuit, a decoupling circuit and a balun circuit;

providing a housing enveloping the antenna;

providing the MRI machine;

inserting said endourethral MRI receiver coil into the urethra of the pediatric patient;

situating the pelvis within a main magnetic field of the MRI machine;

using the MRI machine to excite magnetic resonance signals within tissues surrounding the urethra;

applying gradient magnetic pulses to said human pelvis to spatially encode the magnetic resonance signals;

receiving said magnetic resonance signals in said endourethral MRI receiver coil and producing responsive output signals therefrom;

processing said output signals to obtain data about the tissues surrounding the urethra; and

evaluating said data to diagnose the condition of the pelvis of the pediatric patient.